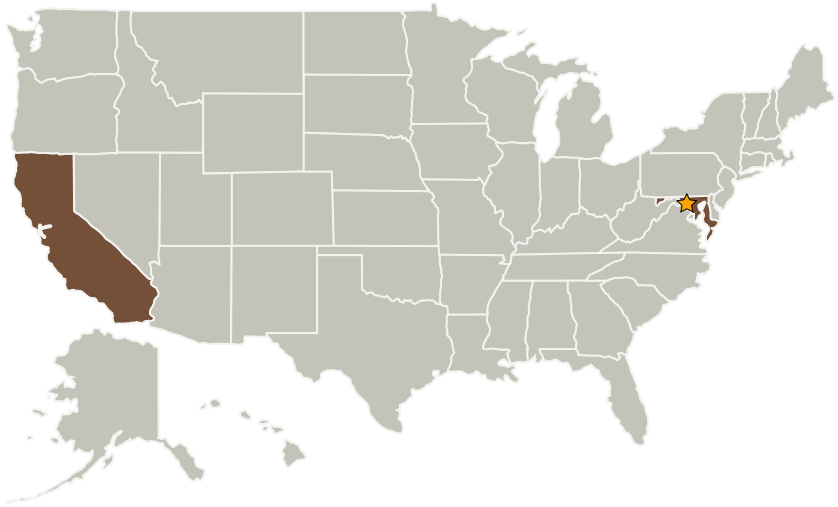
Integration of Superconducting Electrical and Thermal Circuits for Microscale Cooling, Phase I

Completed Technology Project (2006 - 2007)

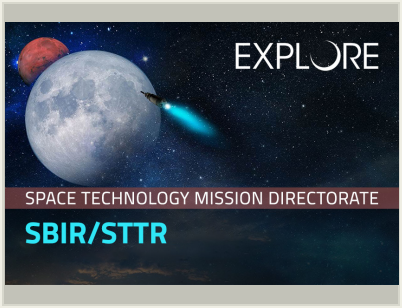
Project Introduction

Microcalorimetry is an enabling technology for many NASA space science missions because it permits detection of single photons at high rates with unprecedented energy resolution and efficiency. This remarkable technology relies upon superconducting devices that must be cooled below 100 mK. We propose to construct a doubly-integrated circuit in which critical features of microcalorimeter pixels on micromachined thermal isolation structures are cooled by microscale refrigerators that exhaust heat into the substrate at 300 mK. In Phase 1 we will demonstrate a new process for fabricating suspended thermal isolation membranes that is planar and fully photolithographic. A parallel Phase 1 activity will be to design a self-contained "omni-orientable" sorption refrigerator as a 300 mK heat sink that can be started and operated in any orientation in order to facilitate retrofitting microcalorimeters to existing materials analysis systems.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Atlas Scientific	Supporting Organization	Industry	San Jose, California



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations	
California	Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.8 Measurement and Control